DIPS Utilities

Several utility programs are supplied with DIPS 4.0. These are described in this chapter.

DIPCAD: DIPS – ACAD Mapping Utilities

This utility facilitates input of joint traces on plan (horizontal) drawings in AutoCAD. Once the traces are input (back mapping) the utility automatically creates a DIPS file.

DIPCAD is contained in your \UTILS\DIPCAD subdirectory. The information in this section can also be viewed as a readme file, by entering the \UTILS\DIPCAD subdirectory and typing *dipcad* at the DOS prompt.

The DIPCAD utilities are designed for mining or surface mapping where the "face" being mapped is horizontal and viewed from above. This is the case in horizontal surface mapping and in underground back mapping where the results are represented on a plan layout of the area being considered.

DIPCAD Requirements

The requirements for use of DIPCAD are:

1) Structure is mapped as lines on a horizontal layout or plan.

2) The drawing is aligned to appropriate "North" (mine north or true north).

3) The drawing is on paper taped to a calibrated digitizing tablet, *or* the drawing is already in ACAD in the form of a horizontal plan view with structure marked as lines.

4) The length of each joint trace should represent the visible extent of the structure.

File Requirements

The following files are required to use the DIPS-ACAD package:

Basic Version — Orientation, length and location data only

DIPS.LSP	LISP file for DIPS-ACAD Contains the following AUTOLISP routines: DIPS – input a geological feature DIPFILE – create a DIPS file (.dip) from all structural blocks in drawing (routine is comprehensive – DIPS file created is ready to run.)
DIPS.DWG	insert BLOCK for DIPS routine
DIPS.TXT	template file for DIPSFILE extraction
DIPS.HDR	HEADER for DIPS file

Advanced Version — Orientation, length and location data PLUS:

SPACING

APERTURE

JR & JA

ROCK TYPE

DIPS2.LSP	LISP file for DIPS-ACAD Contains the following AUTOLISP routines: DIPS2 – input a geological feature DIPFILE2 – create a DIPS file (.dip) from all structural blocks in drawing (routine is comprehensive – DIPS file created is ready to run.)
DIPS2.DWG	insert BLOCK for DIPS routine
DIPS2.TXT	template file for DIPSFILE extraction
DIPS2.HDR	HEADER for DIPS file

In addition, the following 2 files allow viewing of the information in this section as a readme file within the \UTILS\DIPCAD subdirectory:

DIPCAD.TXT	Readme info file
DIPCAD.BAT	Batch file to view DIPCAD.TXT

Digitizing Structure

Place the DIPCAD files (above) in your current working directory.

LOAD or CREATE drawing file with drifts, etc. in which you intend to include geological structure.

If you are digitizing structure from a paper plan using a digitizing tablet, place the plan on the tablet and calibrate the unit (see ACAD manual). Digitize mine layout as required (drifts, stopes ,etc). TRACING as described in the following section refers to digitizing the structural trace with the tablet and pen.

If the structure is already digitized (using some other software or manual input) then you must trace the structure on screen. TRACING in this case refers to onscreen tracing.

Creating Layers

CREATE UNIQUE LAYERS (different from existing structure in drawing file) for each structural type and use meaningful names (13 characters max) such as JOINT, SHEAR, FAULT etc.

eg: LAYER -> NEW -> joint

Type (Basic or Advanced respectively):

(LOAD "DIPS") or (LOAD "DIPS2")

NOTE: YOU MUST INCLUDE THE ( ) and THE " " AS SHOWN!

Make the appropriate layer current (ie JOINT)

eg: LAYER -> SET -> joint

For each joint, type (basic or advanced respectively):

DIPS or DIPS2

and follow instructions. TRACE the structure according to the right hand rule for STRIKE.

NOTE: right hand rule means:

- Hold your right hand out with the palm down and thumb extended horizontally
- Orient your hand so that the fingers point down-dip
- The thumb will then point in the direction of strike.

OR

- If you digitize from 1st point to 2nd point, the DIP is to the right with respect to the direction of the strike line.

(press *Enter* to accept any defaults or enter new values for various properties).

To Save A Dips File

If you have not already done so, type:

(LOAD "DIPS") or (LOAD "DIPS2")

(Basic or Advanced respectively)

Type:

DIPFILE or DIPFILE2

(Basic or Advanced respectively)

Enter a filename (DO NOT USE "DIPS" or "DIPS2" AS A FILENAME).

The DIPS file will be created automatically and will contain all of the structure in the active layers of your drawing.

The extension .DIP is added automatically, do not enter .DIP after the filename.

NOTE:

If any other blocks (ie title blocks etc.) are present, turn OFF all other LAYERS except the structure layers you wish to output. Then use the procedure above.

To save selected subsets of data (ie specific location range):

1) BLOCK all data you wish to save. Use (0,0,0) for insertion point.

2) WBLOCK this block

3) quit

4) start new drawing (1)

5) insert the above BLOCK (at 0,0,0)

6) explode this block

7) proceed with DIPFILE(2) routine as above.

Combining DIPS and DIPS2 Data

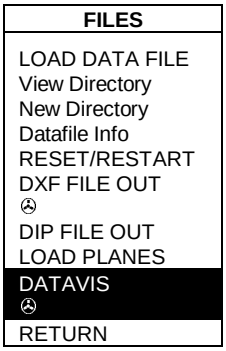
DIPS is designed for rapid input of orientation data only. Length is also calculated based on the trace length digitized.

DIPS2 is designed for collecting structural data for classification and design. Specifically, the JR and JA terms are included for use with BARTONS Q classification system for tunnelling. JR is a roughness index and JA is an alteration index and can be assigned any value you wish.

If DIPS and DIPS2 are both used to create digitized structure, *.DIP files can be created with DIPFILE and DIPFILE2 respectively. These files can be edited together by removing the -1 flag and end of file comments from the first file, removing the header information (from the start of the file up to but not including the first line of data) from the second file and copying the two files together. (>COPY file1+file2 newfile).

If both routines are used in the same drawing, either DIPFILE or DIPFILE2 can be used to extract all of the data. If DIPFILE is used then additional columns in DIPS2 blocks will be dropped. If DIPFILE2 is used then blocks created with DIPS will have blank entries in the additional columns.

DATAVIS: Arbitrary Data (Scalar val vs Orientation) Visualization



DIPS has a new feature called **DATAVIS** in the **FILES** menu. This option allows the user to create a plot of any oriented data set. That is, if a grid of data is created where some (quantitave) value is specified at regular orientation intervals (eg. normal stress, permeability, seismic velocity, etc. as a function of orientation in space), this value can be contoured on a stereonet. **DATAVIS** requires the user to calculate or specify the values at fixed orientation points.

Examples of applications include:

- JOINT FREQUENCY ALONG BOREHOLE
- STRESS (Field or Induced)
- JOINT STABILITY wrt POLE ORIENTATION
- PERMEABILITY
- SEISMIC VELOCITY
- JOINT ROUGHNESS, APERTURE, PERSISTANCE, SPACING, etc wrt POLE ORIENTATION
- SAFETY FACTOR wrt BOLT ORIENTATION
- # OF UNSTABLE BLOCKS (SHI) wrt WALL ORIENTATION
- ....ETC

Sample DATAVIS Utilities

Two sample **DATAVIS** utilities are included with the DIPS package:

JOIFREQ – Plot Joint Frequency and RQD along arbitrary "Borehole" Orientation.

JOISLIP – For a given 3-D stress field plot Normal & Shear stresses on arbitrarily oriented surface (eg. joint). Plot Safety Factor against shear slip and Slip Potential.

In addition, computer source code (C) is supplied for these utilities, to illustrate the creation of your own **DATAVIS** utility.

Both of these utilities read a standard template file output by **DIPS**-> **DATAVIS**. This file contains the TREND & PLUNGE of a number of contour grid points. The utilities perform unique processing of the orientations in this file and output their own **DATAVIS** *.DTV input files with additional data columns attached to the orientations in the template. The user is free to examine the template file *.DTT and the output files *.DTV and create his/her own DATAVIS utility.

Step 1: Creating A Template File

a) Run DIPS normally.

b) **SET OPTIONS** according to preference.

NOTE: OPTIONS SET WHEN TEMPLATE IS SAVED MUST BE USED WHEN VIEWING PROCESSED DATAVIS INPUT FILE.
OF IMPORTANCE TO DATAVIS ARE: PROJECTION (recommend: EQUAL ANGLE) GRID SIZE (recommend 6 % GRID)

Use **SAVE OPTIONS** if desired to preserve settings.

c) Select **FILES->DATAVIS->TEMPLATE**

This will create a file of interpolation grid points denoted by trend and plunge. This file will have a *.DTT extension.

This is the file that is processed by an external utility.

d) EXIT DIPS to run processing utility.

NOTE: THIS PROCESS NEED ONLY BE PERFORMED ONCE (OR ONCE EACH TIME THE "PROJECTION" and "GRID SIZE" ARE ALTERED).
THE EXTERNAL UTILITY CAN USE THE SAME TEMPLATE FILE FROM THEN ON. IT IS IMPORTANT TO **SAVE OPTIONS** IF YOU USE NON-DEFAULT VALUES. OTHERWISE YOU MUST RESET THEM EACH TIME YOU RUN DIPS.

Step 2: Running The Processing Utility

This section is unique to the individual utility. As an illustration, the following are instructions for the JOIFREQ and JOISLIP utilities supplied with this package.

JOIFREQ

(**JOI**nt **FREQ**uency Analysis)

A utility to calculate the joint frequency, Jf (# of joints per metre) along some linear trajectory such as a borehole. Up to 10 joint sets can be used in the analysis.

RQD is calculated according to a negative exponential assumption for joint spacing.(RQD = 100*(t*Jf+1)*e^(-t*Jf) where t =0.1) This is the most likely measure of RQD according to: (PRIEST & HUDSON, 1976. Discontintuity spacing in rock. Int. J. Rock Mech. Min. Sci. & Geomech. Abstr. Vol 13, pp135-148.)

RQD (min) is the minimum possible measure of RQD (same ref).

RQD.t is calculated where threshold t may be any value in metres. Standard RQD is calculated for t = 0.1 (10 cm). RQD.t = 0.5 yields the percentage of total length of pieces > 50cm wrt length of core.

Usage:

a) After DIPS->DATAVIS->TEMPLATE has been run (only once required) to generate the required template file (*.DTT), run JOIFREQ from the DOS Command Line.

b) Input the name of the template created by **DATAVIS**.

c) Input the desired name for the output file.

d) Input the number of joint sets.

e) Input the threshold value for RQD.t (in metres)

f) For each joint set, input:

DIP

DIP DIRECTION

AVERAGE SPACING (Non-Statistical Approach)

g) JOIFREQ will process the file and return to the DOS Command Line.

h) Run DIPS/x FILENAME where filename is the name of the output file.

OR

Run DIPS normally and select FILES->DATAVIS->LOAD to load file.

i) Follow the instructions on screen

ie: TRACK DATA

COMPUTE

SCATTER PLOT

CONTOUR PLOT

JOISLIP

(Ubiquitous **JOI**nt **SLIP** Stability Analysis)

For a user selected stress field (Principal stresses and orientations) this utility calculates the:

Normal Stress & Shear Stress (Magnitude)

Shear Component along DIP

Shear Component along STRIKE

Slip Potential (arctan(Tau/Sign))

Safety Factor Against Slip (for a given Cohesion & Friction)

on the surface of a joint in space and uses **DATAVIS** to plot these values against the orientation of the Pole to the joint. (See Kazakidis & Diederichs. 1993. Understanding rockmass behaviour using a ubiquitous joint approach. Int. J. Rock. Mech. & Min. Sci. & Geomech. Abstr. Vol 30, #2, 151-156.)

Usage:

a) After DIPS->DATAVIS->TEMPLATE has been run (only once required) to generate the required template file (*.DTT), run JOISLIP from the DOS Command Line.

b) Input the name of the template created by **DATAVIS**.

c) Input the desired name for the output file.

d) Input the cohesion (MPa) and Friction (deg) required for Factor of Safety Calculations.

e) For each principal stress, input:

PLUNGE

TREND

STRESS (Compression Positive)

f) JOISLIP will process the file and return to the DOS Command Line.

g) Run DIPS/x FILENAME where filename is the name of the output file, *or*

Run DIPS normally and select **FILES->DATAVIS->LOAD** to load file.

Step 3: Running DATAVIS

a) Run DIPS

b) Select **FILES->DATAVIS->LOAD**

Select desired input file.

c) TRACK DATA

Select Column to be viewed by **DATAVIS** eg:

JOIFREQ	**JOISLIP**
Select one:	*Select one:*
FREQ.,Jf(JTS/m)	Sigma N
RQD(neg.expon.)	Tau Max
RQD(minimum)	Tau Dip
RQD(t=threshold)	Tau Str
	Slip Pot
	Fact of Safety

d) **COMPUTE**

e) **SCATTER PLOT**: This is a check to make sure that the **OPTIONS** PROJECTION and Grid Size have not been altered. All Points should have a single cross and there should be no empty spaces.

POLE PLOT: A secondary check. The grid of points will be symbolically ranked but should appear orthogonal and undistorted. (There will be a slight random wobble in pole positions but general orthogonality should prevail).

f) **CONTOUR PLOT**: Use this as in **DIPS**. The plot represents the value of interest (eg. Joint Frequency) with respect to orientation. All functions work as before.

g) **CONTOUR PLOT->LOCATE POLES->ALT F10**

This will display the VALUE present at the cursor position (orientation) as well as this orientation.

h) **FILES->LOAD PLANES** (**JOIFREQ**)

The JOIFREQ Utility also outputs a *.DWP file of the same name as the DATAVIS input file. This file contains the planes used in the analysis.

Import these planes and overlay them with DRAW PLANES in CONTOUR PLOT.

NOTE: If you select MAJOR PLANES->SELECT PLANES-> ALL(0)->BOTH(B)->LABELS(L), Then the LABELS (In this case the SPACING of the individual joints will appear next to the planes on the plot.

i) **FILES->LOAD PLANES** (**JOISLIP**)

The JOISLIP Utility also outputs a *.DWP file of the same name as the DATAVIS input file. This file contains the "poles" representing the principal stresses and the planes on which they act.

Import these poles & planes and overlay them with DRAW PLANES in CONTOUR PLOT.

AT ANY TIME THE USER CAN SWITCH BETWEEN NORMAL DIPS AND DATAVIS (AND BACK). PREVIOUS WORK WILL BE LOST, HOWEVER, EACH TIME THE SWITCH IS MADE.

Writing Your Own DATAVIS Utility

All that is required to write your own DATAVIS utility is that your program read in a .DTT file and output a .DTV file with processed data attached to each orientation point.

Create a sample DTT file as explained above.

Run JOIFREQ to create a sample DTV file as well as a sample DWP file if desired. View these files with a text editor, paying particular attention to line format in the header and to column format in the data section (as you would in a normal DIPS file). Write your code to read a DTT file and create a DTV and DWP file for use with DIPS.

Remember to use these file extensions as well. The C++ source files are provided for your interest and convenience. *.DTT files can also be manipulated within a spreadsheet if desired and output as *.DTV.

DIPS Data File Editor – DEDIT

As of DIPS 4.0 a DIPS file editor – DEDIT – is supplied with the DIPS package. DEDIT is a text editor which has been specifically designed for the creation and editing of DIPS data files. DEDIT automatically takes care of many of the formatting details of the DIPS data file.

Online HELP Info is available while running DEDIT.

You will find DEDIT in your main DIPS directory, in the file dedit.exe. To run DEDIT, type *dedit* at the DOS prompt. DEDIT is set up in a familiar text editor format, and its use should be self-explanatory. However, online HELP info is available while running DEDIT.

DEDIT creates *.dip ASCII text files for use in DIPS.